

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (original): A prospective abnormal shadow detecting system comprising a prospective abnormal shadow detecting means which detects a prospective abnormal shadow in an image on the basis of image data representing the image and a prospective abnormal shadow information output means which outputs information on the prospective abnormal shadow detected by the prospective abnormal shadow detecting means, wherein the improvement comprises that

a malignancy judging means which judges whether the prospective abnormal shadow detected by the prospective abnormal shadow detecting means is malignant or benignant is provided, and

the prospective abnormal shadow information output means outputs the information on the prospective abnormal shadow in such a manner that whether the prospective abnormal shadow is malignant or benignant as judged by the malignancy judging means can be distinguished.

2. (original): A prospective abnormal shadow detecting system as defined in Claim 1 in which the prospective abnormal shadow information output means outputs an index of the malignancy and/or an index of the benignancy of the prospective abnormal shadow.

AMENDMENT UNDER 37 C.F.R. § 1.111
U. S. Application No. 09/943,347

3. (original): A prospective abnormal shadow detecting system as defined in Claim 1 in which the malignancy judging means judges whether the prospective abnormal shadow detected by the prospective abnormal shadow detecting means is malignant or benignant by

obtaining a benignancy evaluation function value which is a value of an evaluation function for benignancy, a malignancy evaluation function value which is a value of an evaluation function for malignancy, and a normalcy evaluation function value which is a value of an evaluation function for normalcy by defining feature values of the image data by a predetermined function, and

comparing the normalcy evaluation function value with the benignancy evaluation function value and the normalcy evaluation function value with the malignancy evaluation function value.

4. (original): A prospective abnormal shadow detecting system as defined in Claim 3 in which the malignancy judging means obtains first and second likelihood ratios LR1 and LR2 which are respectively defined to be $LR1 = \text{normalcy evaluation function} / \text{malignancy evaluation function}$ and $LR2 = \text{normalcy evaluation function} / \text{benignancy evaluation function}$, and determines that the prospective abnormal shadow is malignant when the first likelihood ratio $LR1 > \text{the second likelihood ratio } LR2$ and at the same time, the first likelihood ratio $LR1 > \text{a first threshold value}$, and that prospective abnormal shadow is benignant when the first likelihood ratio $LR1 < \text{the second likelihood ratio } LR2$ and at the same time, the second likelihood ratio $LR2 > \text{a second threshold value}$, and otherwise that the prospective abnormal shadow is a shadow of a normal part.

AMENDMENT UNDER 37 C.F.R. § 1.111
U. S. Application No. 09/943,347

5. (original): A prospective abnormal shadow detecting system as defined in Claim 3 in which the normalcy evaluation function value is the Mahalanobis distance from a normal tissue distribution, the benignancy evaluation function value is the Mahalanobis distance from a benignant tissue distribution, and the malignancy evaluation function value is the Mahalanobis distance from a malignant tissue distribution.

6. (original): A method of judging whether a prospective abnormal shadow detected on the basis of image data representing an image is malignant or benignant comprising the steps of obtaining a benignancy evaluation function value which is a value of an evaluation function for benignancy, a malignancy evaluation function value which is a value of an evaluation function for malignancy, and a normalcy evaluation function value which is a value of an evaluation function for normalcy by defining feature values of the image data by a predetermined function, and

comparing the normalcy evaluation function value with the benignancy evaluation function value and the normalcy evaluation function value with the malignancy evaluation function value.

7. (original): A method as defined in Claim 6 characterized by the steps of obtaining first and second likelihood ratios LR1 and LR2 which are respectively defined to be $LR1 = \text{normalcy evaluation function} / \text{malignancy evaluation function}$ and $LR2 = \text{normalcy evaluation function} / \text{benignancy evaluation function}$, and

determining that the prospective abnormal shadow is malignant when the first likelihood ratio $LR1 > \text{the second likelihood ratio } LR2$ and at the same time, the first likelihood ratio $LR1 > \text{a first threshold value}$, and that prospective abnormal shadow is benignant when the first

AMENDMENT UNDER 37 C.F.R. § 1.111
U. S. Application No. 09/943,347

likelihood ratio $LR1 < \text{the second likelihood ratio } LR2$ and at the same time, the second likelihood ratio $LR2 > \text{a second threshold value}$, and otherwise that the prospective abnormal shadow is a shadow of a normal part.

8. (original): A method as defined in Claim 6 in which the normalcy evaluation function value is the Mahalanobis distance from a normal tissue distribution, the benignancy evaluation function value is the Mahalanobis distance from a benignant tissue distribution, and the malignancy evaluation function value is the Mahalanobis distance from a malignant tissue distribution.

9. (original): An apparatus for judging whether a prospective abnormal shadow detected on the basis of image data representing an image is malignant or benignant comprising

an evaluation function value calculating means which obtains a benignancy evaluation function value which is a value of an evaluation function for benignancy, a malignancy evaluation function value which is a value of an evaluation function for malignancy, and a normalcy evaluation function value which is a value of an evaluation function for normalcy by defining feature values of the image data by a predetermined function, and

judging means which judges whether the prospective abnormal shadow is malignant or benignant by comparing the normalcy evaluation function value with the benignancy evaluation function value and the normalcy evaluation function value with the malignancy evaluation function value.

10. (original): An apparatus as defined in Claim 9 in which the judging means obtains first and second likelihood ratios $LR1$ and $LR2$ which are respectively defined to be $LR1 = \text{normalcy evaluation function} / \text{malignancy evaluation function}$ and $LR2 = \text{normalcy}$

AMENDMENT UNDER 37 C.F.R. § 1.111
U. S. Application No. 09/943,347

evaluation function/benignancy evaluation function, and determines that the prospective abnormal shadow is malignant when the first likelihood ratio $LR1 >$ the second likelihood ratio $LR2$ and at the same time, the first likelihood ratio $LR1 >$ a first threshold value, and that prospective abnormal shadow is benignant when the first likelihood ratio $LR1 <$ the second likelihood ratio $LR2$ and at the same time, the second likelihood ratio $LR2 >$ a second threshold value, and otherwise that the prospective abnormal shadow is a shadow of a normal part.

11. (original): An apparatus as defined in Claim 9 in which the evaluation function calculating means calculates the Mahalanobis distance from a normal tissue distribution as the normalcy evaluation function value, the Mahalanobis distance from a benignant tissue distribution as the benignancy evaluation function value, and the Mahalanobis distance from a malignant tissue distribution as the malignancy evaluation function value.

12. (new): A prospective abnormal shadow detecting system as defined in claim 1, wherein said feature values comprise at least one of a degree of convergence of gradient vectors, an output value of an iris filter, and an output value of a morphology filter.

13. (new): A prospective abnormal shadow detecting system as defined in claim 1, wherein said malignancy judging means calculates margins of said feature values with respect to respective threshold values of said feature values, and outputs said feature values and said margins.

14. (new): A prospective abnormal shadow detecting system as defined in claim 1, wherein said prospective abnormal shadow information output means displays an overall image, a processed interest area image, said feature values and calculated margins of said feature values in one frame.

AMENDMENT UNDER 37 C.F.R. § 1.111
U. S. Application No. 09/943,347

15. (new): A prospective abnormal shadow detecting system as defined in claim 1, wherein whether the prospective abnormal shadow is malignant or benignant as judged by the malignancy judging means is distinguished visually.

16. (new): A prospective abnormal shadow detecting system as defined in claim 1, wherein the information on the prospective abnormal shadow output by the prospective abnormal shadow information output means comprises a visible marking.